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COMPARATIVE STUDIES OF A GROUP OF HEAD START AND A GROUP OF NON-HEAD START PRESCHOOL CHILDREN. FINAL REPORT.

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TWO GROUPS OF CHILDREN ATTENDED THE UNIVERSITY OF KANSAS NURSERY SCHOOL FOR EIGHT WEEKS. THE MORNING CLASS WAS HELD FOR 20 FOUR-YEAR-OLD CHILDREN OF MIDDLE-CLASS FAMILIES. THE AFTERNOON CLASS WAS FOR 24 FIVE-YEAR-OLD CHILDREN OF LOW-INCOME FAMILIES. THREE COMPARATIVE STUDIES WERE MADE. IN STUDY I NO CHANGE WAS FOUND ON THE PEABODY PICTURE VOCABULARY TEST IN THE MIDDLE-CLASS GROUP, WHEREAS AND INCREASE IN SCORES WAS FOUND FOR THE HEAD START GROUP. THE PRESCHOOL INVENTORY SHOWED THE MIDDLE-CLASS PRESCHOOL GROUP TO BE SIGNIFICANTLY HIGHER IN PERFORMANCE, BUT SOME CHANGES DID OCCUR OVER THE SUMMER FOR THE HEAD START GROUP. IN STUDY II NO OVERALL DIFFERENCES WERE FOUND BETWEEN THE GROUPS ON TWO DISCRIMINATION LEARNING TASKS, BUT AN INTERACTION OF GROUP AND SEX WAS INDICATED. IN STUDY III CHILDREN JUDGED TO BE LOW IN SOCIAL RESPONSIVENESS WERE SELECTED FROM THE TWO GROUPS, AND THEIR PERFORMANCE IN A LABORATORY SETTING WAS ASSESSED. THE MAJOR DIFFERENCES BETWEEN THE HEAD START AND MIDDLE-CLASS GROUP IN A BASELINE ASSESSMENT APPEARED TO BE IN VOCALIZATIONS. A FINAL IMPLICATION OF THIS STUDY IS THAT THE PERSISTENT BEHAVIORAL DEFICIENCES OF THE HEAD START CHILDREN REVEALED IN THE BASELINE SESSIONS APPEAR TO BE REVERSIBLE. (CO'D)

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COMPARATIVE STUDIES OF A GROUP OF HEAD START AND A GROUP OF NON-HEAD START PRESCHOOL CHILDREN[1]

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During the summer of 1965 two groups of children met at The University of Kansas Nursery school for eight weeks. Five mornings a week, from 9:15 to 11:45 A. M., a group of 20 four year old children attended. These children had been enrolled according to the date at which their parents had first put them on the waiting list for the regular preschool session. They were largely from middle class managerial and professional families who had paid the summer session fee of $35.00. Five afternoons a week, from 1:00 to 4:00 P.M., a group of 24 five year old children attended. These children had been enrolled as part of a Head Start project and met the criteria for family income and school starting established by the Office of Economic Opportunity. These children paid no fees.

In addition to the obvious differences in socio-economic background and age the groups also differed in the kinds of daily preschool routines to which they were treated during the eight weeks. The regular preschool children were brought to school by their parents or in parent arranged car-pools. The Head Start children were transported to the school by paid drivers. The regular preschool group had the traditional crackers and juice mid-morning snack; the Head Start group was served a nutritiously balanced mid-afternoon luncheon. In these and other ways the groups differed. The gross socio-economic differences invited comparative study; at the same time other sources

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of variability were so large as to seriously limit the kinds of inferences that might be drawn from the results of any comparative study of the two groups. Nevertheless, the positive aspects of the opportunity to conduct some comparative studies outweighed the limitations inherent in such comparisons.

Three comparative studies were carried out. Two involved all or most of the children in each group. The third was an experimental study on a selected sample of children from each group. Study I involved administration of selected Project Head Start tests and evaluation measures to both the Head Start and the regular preschool groups. Study II attempted to look at the differences in the two groups of children on two standard experimental discrimination learning tasks. One was administered in the first two weeks of the summer program and the other was administered during the last two weeks of the summer program. Study III involved a setting devised to check out some assumptions about social responsiveness of Head Start children and to do some exploratory work in the modification of social responsiveness.

Each of these studies is reported separately below. It should be noted that the experimental design and the experimental controls throughout the three studies were of uneven quality. In some instances complete sets of data were collected. In some instances, notably in Study III, subject absences and time limitations sharply curtailed any possibility of a completely counterbalanced design. The speed with which the Head Start program was initially established and the brief time between notification of approval of the research and the beginning of the summer session imposed limits beyond the control of the investigators. For similar reasons other control groups were not included in the studies. Inclusion of these other groups would have increased the probability that clear conclusions could be drawn from the research. Hence, there is an inherent limitation on the generality of the results obtained in this research. It must be regarded, in every sense of the phrase, as yielding pilot project data.

STUDY I

This study involved the administration of Project Head Start evaluation measures to both the Head Start group and the regular Kansas University group (hereafter referred to as Head Start and KU). After the measures were collected they were tabulated and have been analyzed to determine two facts: What differences existed between the Head Start and KU groups: What changes occurred over the eight week summer program.

Method

Subjects

The children included in this study involved all of the children in both groups. In the Head Start group there were twenty-four children, sixteen males and eight females. The age range, in years and months was 4-5 to 5-11 with a mean age of 5-2. Of the group about 63% (15) were Negro; approximately 29% (7) were Caucasian; and about 8% (2) were Mexican-American. Nineteen (79%) of the children had attended a volunteer run half-day nursery school for children from low income families for one or two half days a week during the just preceding year, while five (21%) had had no prior nursery school experience.

In the KU group there were twenty children, nine males and eleven females. The age range was 3-7 to 4-8 with a mean age of 4-2. All of the children in the KU group were Caucasian. Of this group approximately 55%

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(11) had previous nursery school experience, while approximately 54% (9) had had no previous nursery school experience.

Evaluation Instruments and Procedure

Every child in the Head Start group underwent a medical and dental examination and was evaluated on the Peabody Picture Vocabulary Test, the Preschool Inventory, the Behavior Inventory, and the Psychological Screening Procedure. All parents of the Head Start children responded to the Social Experience Inventory and made an evaluation of the Head Start program.

This report includes comparisons of the children in the KU group with the children in the Head Start group on the Peabody Picture Vocabulary Test and the Preschool Inventory.[4] The parents of the KU children were also asked to fill out the Social Experience Inventory.

Each test and evaluation procedure was administered to the KU and Head Start children on the schedule suggested by Project Head Start Evaluation and in the manner requested. The conditions for each of the instruments are described below.

Peabody Picture Vocabulary Test (PPVT). The PPVT was individually administered twice to all the children in each group during the third and fourth weeks of the summer session by the Staff Director of the Head Start Project.[5] The Director was a trained master's level nursery school teacher and during the regular school year was regularly one of the Head Teachers of the KU Nursery School. However, she had not taught any of the children enrolled in the summer KU group and hence was not previously acquainted with the children from either group. The PPVT was administered a second time during the seventh week of the summer session by the same tester to 23 of

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the 24 Head Start children and to 16 of the 20 KU children. The Head Start child and one of the KU children not retested were consistently absent. Three KU children refused to cooperate in the second testing session. Each test was conducted in a research room at the nursery school. Approximately 10 to 15 minutes were required for each administration.

Preschool Inventory (PI). The PI was individually administered to each child in both groups during the third and fourth weeks of the summer session. Absences in the Head Start group necessitated administration during the fifth week for three children. In the Head Start group the PI was administered a second time to 23 of the 24 children during the eighth week of the session. The Staff Director and a research assistant[6] (a graduate student in Psychology) administered all of the PIs to the Head Start Children. In the KU group the staff director and a qualified volunteer[7] (former Instructor in Child Development) administered the inventory. All the inventories were given at the Nursery School in one of the research rooms and each administration required about 45 minutes.

Social Experience Inventory (SEI). The parents of the children in both groups were asked to respond to the SEI. In the Head Start group the Parent Coordinator and a student assistant[8] visited each home during the fifth and sixth weeks of the summer session and obtained the information during an interview. In the KU group the SEI was given out by the Head Teacher during the fifth week of the summer session and the parents returned it to her when they had completed it.

Results

PPVT. The data from the PPVT were treated in the following manner. The number of correct responses was recorded for each child where informa-

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tion was available for both Test 1 and Test 2. (23 Head Start children and 16 KU children.) A summary of the Lindquist Type I analysis of variance on the data is shown in Table 1, and the means and standard deviations of the groups are shown in Table 2. As can be seen from the analysis of variance the main effects of groups and tests were significant. Overall the KU group had a higher mean number of correct responses than the Head Start group and overall the mean of the second test was higher than on the first test. As can be seen from the means in Table 2 the significant groups x test interaction was largely due to the change in scores of the Head Start group from test 1 to test 2. While the KU children did not

TABLE 1

Summary of Analysis of Variance of Number of Correct Responses on the Peabody Picture Vocabulary Test.

Source	df	MS	F
Between	38		
Groups	1	1302.00	11.93 ***
$\text{Error}_{(b)}$	37	109.16	
Within	39		
Tests	1	149.00	7.52 *
Groups x Tests	1	134.00	6.76 **
$\text{Error}_{(w)}$	37	19.81	
TOTAL	77		

* .01

** .025

*** .005

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TABLE 2

Means and SDs for Head Start and KU Children on
First and Second PPVT

		Test 1		Test 2	
	N	$\bar{X}$	SD	$\bar{X}$	SD
KU	16	50.6	7.7	50.2	6.6
Head Start	23	39.6	9.5	44.6	7.8

change at all, the mean number of correct responses of the Head Start group increased from 39.6 to 44.6. The results of the t tests indicated that this increase was significant at < .10 level. At both the first and second testing the KU children had a significantly higher mean number of correct responses when compared to the Head Start children.

Preschool Inventory. Though the full 148 items of the Preschool Inventory were administered to each child analysis was done on the 80 items comprising the revised short form (as revised by Caldwell) and scored according to the original instructions. These 80 items were grouped into the six following recommended content areas:

> Basic Information and Vocabulary (12 items); Number Concepts and Ordination (21 items); Concepts I -- size, shape, motion and color (17 items); Concepts II -- time, object, class, and social (14 items); Visual Motor (4 items); Following Instructions (12 items).

The total number of scored points was computed for each child in each of the content areas. In content area we then had the total and mean number of scored points for the KU children and for the Head Start children at the first and at the second testing. Complete data for twenty KU children and 22

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Head Start children were included in the analysis. Table 3 shows the mean number of scored points and the standard deviations for each of these calculations.

TABLE 3

Means and Standard Deviations of Scored Points on the Preschool Inventory

Content Area	KU (N = 20)		HS_1 (N = 22)		HS_2 (N = 22)	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Basic Information and Vocabulary	19.6	4.0	17.1	4.4	17.7	5.7
Number Concepts and Ordination	13.4	5.7	10.7	4.4	11.0	4.6
Concepts I	17.9	3.8	12.3	5.2	12.9	5.9
Concepts II	17.3	6.1	12.5	5.3	14.5	5.0
Visual Motor	11.9	6.2	7.4	4.6	7.7	6.1
Following Instructions	18.2	4.4	15.1	3.7	14.9	5.2

In order to compare the means, three t tests were computed for each content area: KU vs. HS_1, KU vs. HS_2 and HS_1 vs. HS_2. The KU and HS comparisons utilized the t test for independent measures while the HS_1 and HS_2 comparison was based on a t test for related measures. Table 4 shows the results of these tests.

The statistical tests indicated that KU children performed significantly better than the HS children in all areas on both administrations. At the end of the summer the HS children's performance, compared to the KU children during the third and fourth weeks of the summer was no longer significantly different in three areas (Basic Information and Vocabulary, Number Concepts and

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TABLE 4

Results t Tests for Each Content Area on the Preschool Inventory
(t values and significance)

Content Area	KU vs. HS_1 (df = 40)		KU vs. HS_2 (df = 40)		HS_1 vs. HS_2 (df = 21)		
Basic Information and Vocabulary	1.92	s < .05	1.23	ns	1.26	ns	
Number Concepts and Ordination	1.73	s < .05	1.51	ns	1.49	ns	(<.10)
Concepts I	3.84	s < .01	3.23	s < .01	1.10	ns	
Concepts II	2.74	s < .01	1.63	ns (<.10)	1.06	ns	
Visual Motor	2.60	s < .01	2.16	s < .05	.88	ns	
Following Instructions	2.48	s < .01	2.20	s < .01	1.42	ns	

Ordination, and Concepts II). A comparison of the performances of the HS children at the beginning and end of the summer session revealed no significant differences (the t tests for Number Concepts and Ordination approached significance). However, inspection of the means in Table 3 reveals that in all areas except Following Instructions the means of the HS second test are higher than the means of the HS first test. Further review of Table 3 indicates that in each area the means of the KU children are in all cases higher than the means of the HS children.

Social Experience Inventory. An item by item analysis was carried out on the inventory by means of χ^2 tests comparing the HS and KU responses to all the items except 18 and 20. For each item an χ^2 analysis was set up with the frequency of responses to each category in the item. Some category answers were grouped: e.g. item 1 "How often do you attend club organization meetings?" had six possible answers -- once a week; twice a month; once every one to three months; two or three times a year; once a year or less; never. Answers were grouped as to the frequency of respondents checking one of the first three categories vs. the frequency of respondents checking one of the last three categories. This grouping occurred on nine items. If an item had seven possible answers the first three vs. the last four checks were tabulated. This occurred for another nine items. Four items had eight possible answers. They were tabulated on the basis of frequency of response to the first four categories vs. the last four. Two items with five possible categories were figured on the basis of 1-3 vs. 4-5. Two items with four categories were tabulated for each category while one item with four categories was tabulated for the first two categories vs. the last two. Five items had yes or no possible answers and were analyzed in terms of these categories. Two items (nos. 33 and 36) were analyzed in terms of their separate parts so that item 33 had four separate χ^2s while item 36 had twenty χ^2 analyses. Thus, a total of 61 χ^2 tests (with Yates correction) were computed. Of these 21 yielded significant results. (Items 1, 2, 25, 26, 28, 31, 32, 33a, 33b, 33c, 33d, 33e, 34, 35, 36a, 36d, 36f, 36g, 36i, 36n, 38 and 40a.) The content of these significant items and the direction of the results were as follows:

Items 1 and 2: Both mothers and fathers of KU children reported that they attended club or organization meetings more frequently than their HS counterparts.

Item 14: Seven of 23 HS parents reported their children as watching TV 5-7 hours per day while no KU parents reported that much TV attendance.

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Item 25 and 26: More extra-home activities were reported for KU parents than for HS parents.

Item 28: HS fathers were reported to vote less often than KU fathers. (Interestingly, no reported differences occurred for the mothers.)

Item 31 and 32: KU parents reported more travel than HS parents.

Item 33a-33e: KU mothers reported more travel by car, bus, train, plane, and passenger boat than HS mothers.

Item 34 and 35: Both KU parents were reported as participating in hobbies more than HS parents.

Item 36a, d, f, g, l, n: KU mothers reported their children as going more often to the library, post office, zoo, museum, department store, and restaurant.

Item 38: KU children were reported as having more toys, books, pencils, crayons etc. at home than HS children.

Item 40a: No KU children were reported as sleeping in a room with four or more other children while six of the twenty-three HS children were so reported.

All other items yielded non-significant χ^2s. They included questions on radio and phonograph ownership and use, TV ownership and adult watching, adult attendance at religious services, child attendance at Sunday School, changing residences, and ownership of pets. In movie attendance the χ^2 test was not significant. However, in this item "never" was grouped with once a month and two or three times a year. Inspection of the results indicated that twelve of the 23 HS mothers reported that they "never" attended movies while no KU mother reported this.

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Discussion

While the results of the Peabody Picture Vocabulary Test analysis must be interpreted cautiously they are intriguing. It is clear that the Head Start children, even though a year older than the KU children were significantly below the KU children in the vocabulary skills which the Peabody was designed to measure. It is therefore interesting that the KU children showed no change over the four or less weeks that intervened between tests while the Head Start children showed a clear increase. Unfortunately it cannot be concluded that the change in scores resulted from significant learning experiences in the Head Start program. Equally plausible is the interpretation that the change in scores reflected a warm-up effect as well as familiarity with the tester and the testing situation. While a majority of the KU children and most of the Head Start children had some previous nursery school experience, the KU children had probably been exposed to a wider variety of testing situations during the regular preschool session in the just completed academic year. Also, the tester was a Caucasian and had probably been seen by some of the KU children who had been enrolled during the spring semester.

The addition of a group of children similar to the Head Start children but who had not been enrolled in a Head Start program would have provided an interesting and essential control group for any more conclusive results to have been obtained. However, whatever the precautions of interpretation the fact remains that some change did occur from first to second test.

Change was also evident in five of the six content areas of the preschool inventory, but not enough to bring the Head Start children up to the performance level of the KU children. When one takes into account the year difference between the two groups the consistent direction of the differences clearly

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suggest the strong disadvantages which accompany Head Start children as they begin school. However, as with the results of the PPVT and for many of the same reasons caution must be applied in interpreting these findings. Further, the Preschool Inventory was not administered to the KU children at the end of the summer so that a complete set of comparisons cannot be drawn. How much of the slight changes noted for the Head Start children can be attributed to warm-up effects and how much to the Head Start experience itself cannot be clearly distinguished at this time. The fact that performance differences of the Head Start children from first to last were not significantly different in a statistical sense counsels caution in interpreting the results on the Preschool Inventory.

The results from the analysis of the Social Experience Inventory were not surprising. Where differences existed they tended to reflect more extra-home involvement and experience for KU parents than HS parents. With the exception of hobbies, sleeping arrangements for children and acquisition of child play materials the in-home behavior as reported by the two groups was not different. Some extra-home activities cost money (e.g. movies, possible baby-sitting costs, club dues, etc.), but not all. The role of the economic factor could be speculated upon. These results provided a descriptive picture not too different from the one painted by American sociologists. The implications and controlling factors remain to be investigated.

In sum, Study I revealed interesting differences between the two groups of children and some evidence that changes in the Head Start children occurred. Even if the changes are largely attributed to testing warm-up effects, nevertheless the changes occurred. Further, the differences were mainly in the direction of increased competence and actually were comparisons from the third

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and fourth weeks to the seventh and eighth weeks. Comparisons between the first and eighth weeks might have yielded more dramatic results. If these changes remained stable over the four week interval between the end of the summer program and the beginning of the public school program then it might be said that some head start did occur. If follow-up reveals that the Head Start children tended to perform at a higher level in school than comparable children who did not attend the Head Start session then the findings of the present study can be interpreted with greater confidence.

STUDY II

We were interested in obtaining some data on the performance of the two groups of children in standard experimental discrimination learning tasks and were also interested in comparisons of the two groups in the beginning and at the end of the summer session. The two problems chosen involved simultaneous and successive discrimination problems under social reinforcement conditions which have proven to be maximally effected in other discrimination learning studies of the senior author. These conditions involved feedback from the adult experimenter after every response, indicating to the subject whether the response was right or wrong.

Method

Subjects

A random sample of nine boys and nine girls was chosen from the Head Start group and a random sample of seven boys and seven girls was chosen from the KU group.

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Apparatus

The apparatus used for both the simultaneous and the successive problems consisted of a box-like response panel on which there were three clear glass buttons (one button was covered for the successive problem), where the colors appeared and which could be depressed for the response. The other half of the apparatus was the control panel where the colors could be changed.

Procedure

Each S was taken individually to a research room in the Nursery School by E. He was seated in front of the apparatus and shown how it worked. For the first testing session which occurred during the second week of the summer session the Experimenter illustrated how the apparatus worked. The problem was a three stimulus simultaneous discrimination problem in which red, green, and blue appeared in the appertures on each trial but on each trial they were differently located. S's task involved pushing the apperture with the same color every time (red) no matter which apperture it appeared in. S was told that he had to find the right one each time and that E would tell him when he was right and when he was wrong.

The three stimulus simultaneous discrimination problem was then administered until each S had made 18 consecutive correct responses or had received 54 trials.

During the last week of the summer session each S returned to the research room with the same E, was seated before the same apparatus and given similar instructions. This time, however, the problem was a two stimulus successive problem during which two colors appeared in two of the three appertures (the third one was covered over). In this problem on any given trial both appertures showed the same color (i.e. two reds or two greens) and the task of S was

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to learn to push the left stimulus when green appeared and the right stimulus when red appeared. A partial sample of each task is shown in Table 5. Again, *S*s were reinforced by being told when they were right and when they were wrong, and the same criterion was used for administration of trials.

TABLE 5

Discrimination Tasks

Simultaneous				Successive		
Trial 1	*red*	green	blue	Trial 1	*green*	green
Trial 2	green	blue	*red*	Trial 2	red	*red*
Trial 3	blue	*red*	green	Trial 3	red	*red*
Trial 4	green	blue	*red*	Trial 4	*green*	green

The colors underlined show the color which was reinforced on the simultaneous problem and the positions which were reinforced on the successive problem.

Results

The number of correct responses for each of six blocks of nine trials for the two problems were incorporated into a Lindquist Type VI analysis of variance that included Subject Group and Sex of Subjects as the between factors and Discrimination Problem and Trials as the within factors. Figures 1 and 2 illustrate the curves for the two problems classified by subject group and sex of subject. The results of the analysis of variance indicated group of subjects (Head Start vs. KU) and sex of subject were not overall significant factors. However, the sex of subject x group interaction was significant. These curves are shown in Figure 3.

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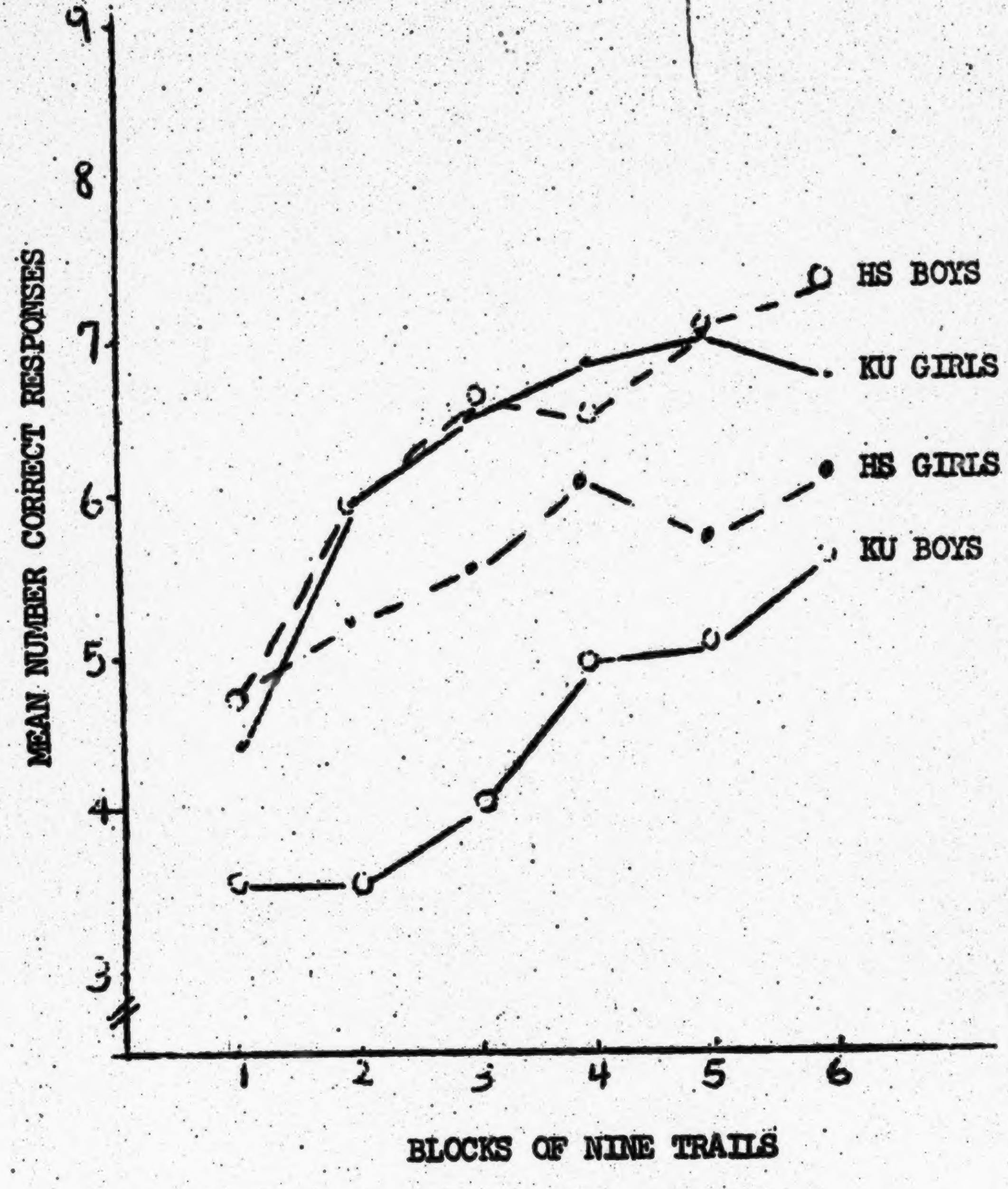
FIGURE 1



SIMULTANEOUS PROBLEM

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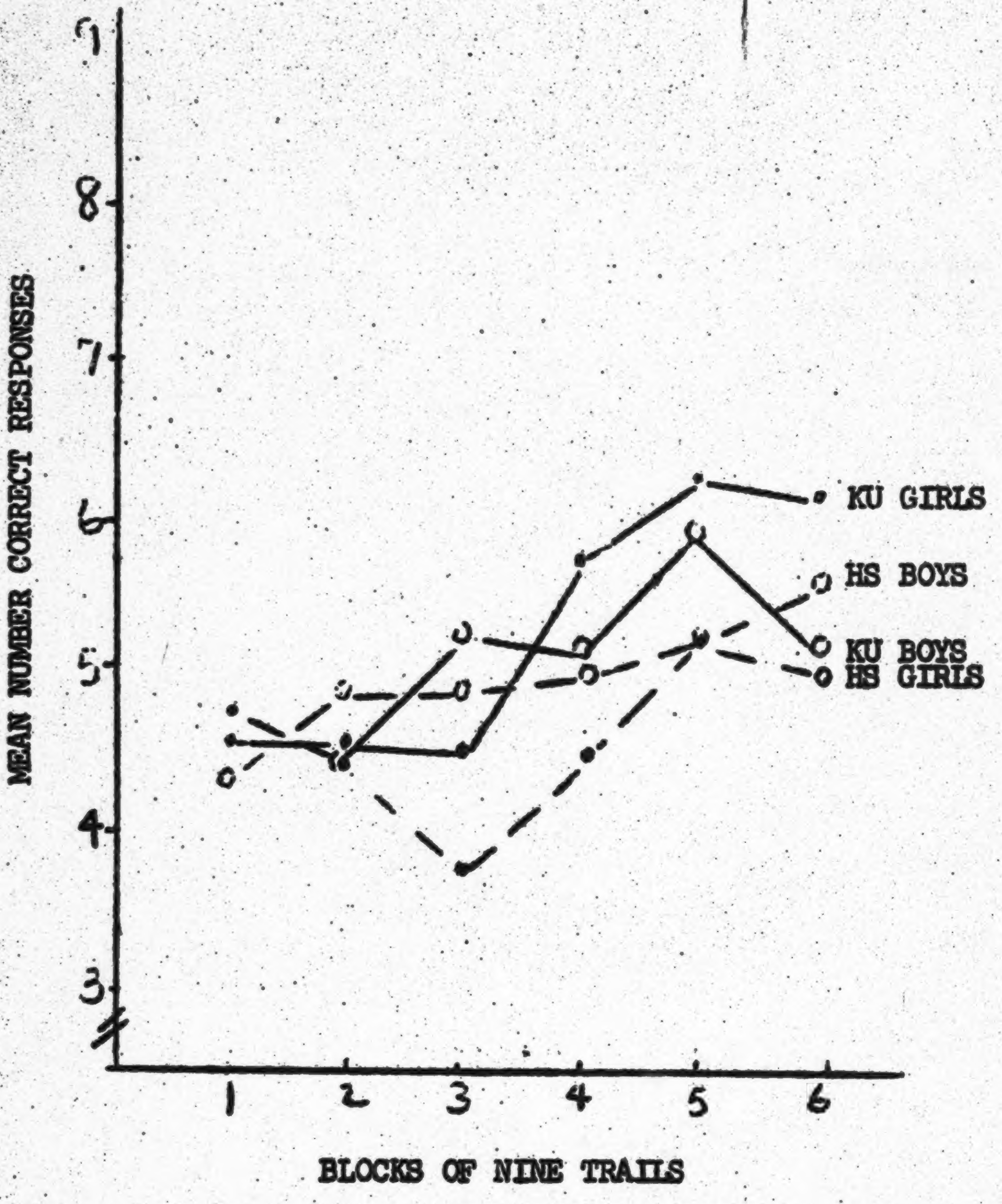
FIGURE 2



SUCCESSIVE PROBLEM

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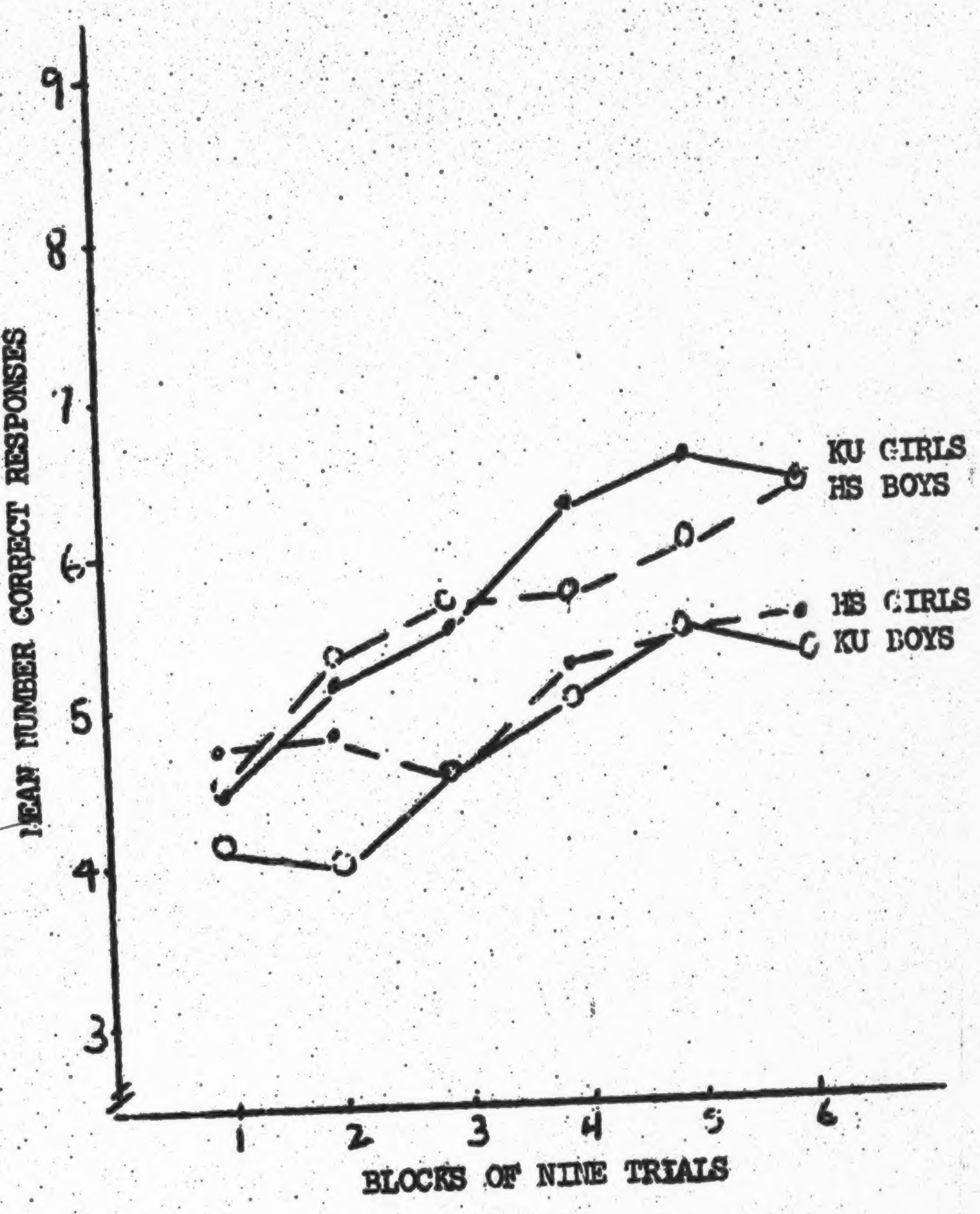
FIGURE 3



GROUP X SEX

Futher analyses indicated that in the trials x problem interaction the curves of the two problems began to diverge significantly at the third trial block with performance on the simultaneous problem better than on the successive problem.

Analysis of the Group x Sex interaction indicated the following: the Head Start boys and the KU boys showed similar levels of performance. Further, the Head Start girls showed performance levels similar to the KU boys. Both the KU girls and the HS boys performed significantly better then the HS girls and the KU boys.

A look at individual performances on each of the discrimination problems yields the following information on the percent of learners and nonlearners in each group (Table 6).

TABLE 6

Individual Performances on Discrimination Problems

	Simultaneous		Successive	
	Learners	Non Learners	Learners	Non Learners
KU Girls	71%	29%	43%	57%
KU Boys	29%	79%	14%	86%
HS Girls	44%	56%	0%	100%
HS Boys	78%	22%	0%	100%

Discussion

The most interesting result in this study centers about the group x sex interaction and in the percentage of learners and non-learners. It is clear that, particularly on the simultaneous problem the KU girls and the HS boys

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were very similar. This result mitigates against any generalizations about discrimination learning in Head Start and non-Head Start groups, particularly on the easier discrimination problem. On the more difficult problem there was a difference between the two groups with no Head Start children among the learners. The successive problem is typically a difficult one for preschool children and the percentage of learners in the KU group is not high.

The approximate year difference in age did not appear to put the Head Start group in a significantly better position. If one were being speculative one might look at the data in the following way: The generally accepted proposition that girls show faster development than boys might hold for the middle income KU group but not for the low income Head Start group. In fact, the reverse might be true.

One further fact is of interest. While the Head Start boys did equal the performance of the KU girls they were not significantly above the KU girls. Again, the one year of age advantage did not appear to operate in the expected manner.

Since basic discrimination learning is thought to underlie much of the skills required in typical school tasks these findings are of interest. However, they are descriptive in nature. They do not suggest how learning situations can be modified to produce more adequate performance. In this sense these are baseline data which point to the descriptive nature of the level of acquisition of Head Start children as compared to a middle class income group of children.

STUDY III

It has often been said that children with learning deficits lack appropriate orienting responses to both adults and to the relevant stimulus aspects of problem tasks. It has also been suggested that effective reinforcers serve to maintain a child's attention to a learning task. If the typical social reinforcements dispensed in typical classroom settings are not effective reinforcers for children, they will not increase task attentiveness. Such reasoning can be used to partially explain the lower level of school achievement found among children who come from lower-socioeconomic backgrounds. If this is, in fact, true then increasing a child's attention to and interaction with rewarding adults should eventually increase the general effectiveness of social reinforcers in learning situations. Therefore, the research which was proposed and carried out in Study III was aimed at (1) describing the nature of child-adult interaction in a selected sample from a Head Start population and in a selected sample from a middle-class preschool population; (2) attempting an experimental modification of social responsiveness in a small number of children from both groups with the goal of increasing social responsiveness to strange and familiar adults.

The sample which was selected constituted a group of children who were adjudged by the preschool teachers as being the least socially responsive children in the group. These children were then observed in a laboratory setting interacting with a typical teacher-adult and from this group four children were selected for further study. The methods employed and the measures taken are described below.

Method

Selection of Subject Sample

Subjects were selected to fulfill two objectives: (1) a comparison of the KU and Head Start children with respect to their responsiveness to stimuli in a teaching situation; (2) an attempt to increase the level of responsiveness of children in the sample who were least responsive in the comparison study. To aid in this selection of the initial sample four teachers and helpers from each of the groups were asked to rank order the children in their respective groups during the second week of the summer program. They were asked to make their rank order in terms of the typical level of social responsiveness the children had shown to adults in the preschool setting. The results of these rankings indicated that there were seven children from each group who were consensually rated as least responsive and were thus selected for the comparative study. The subjects selected included five girls and two boys from the Head Start group and four girls and three boys from the KU group.

Comparison of KU and Head Start Children

An experimental setting was devised to permit direct objective assessment of the orienting and attending responses of each child to a variety of stimulus conditions considered representative of a wide range of the variables commonly found in classrooms. Three classes of responses of subjects were measured: visual, vocal, and manual. The visual responses were subclassified into attention to three classes of stimuli: the teacher herself, the teacher's instructional materials, and the subject's task materials. Each class of response was assessed in a variety of tasks, in each of which different response classes and stimulus materials were emphasized.

Experimental Setting

The experimental sessions took place in a 13 x 15 foot room (see Figure 4) at the Bureau of Child Research Laboratory Building which was located approximately three blocks from the preschool. A child-size table and chair

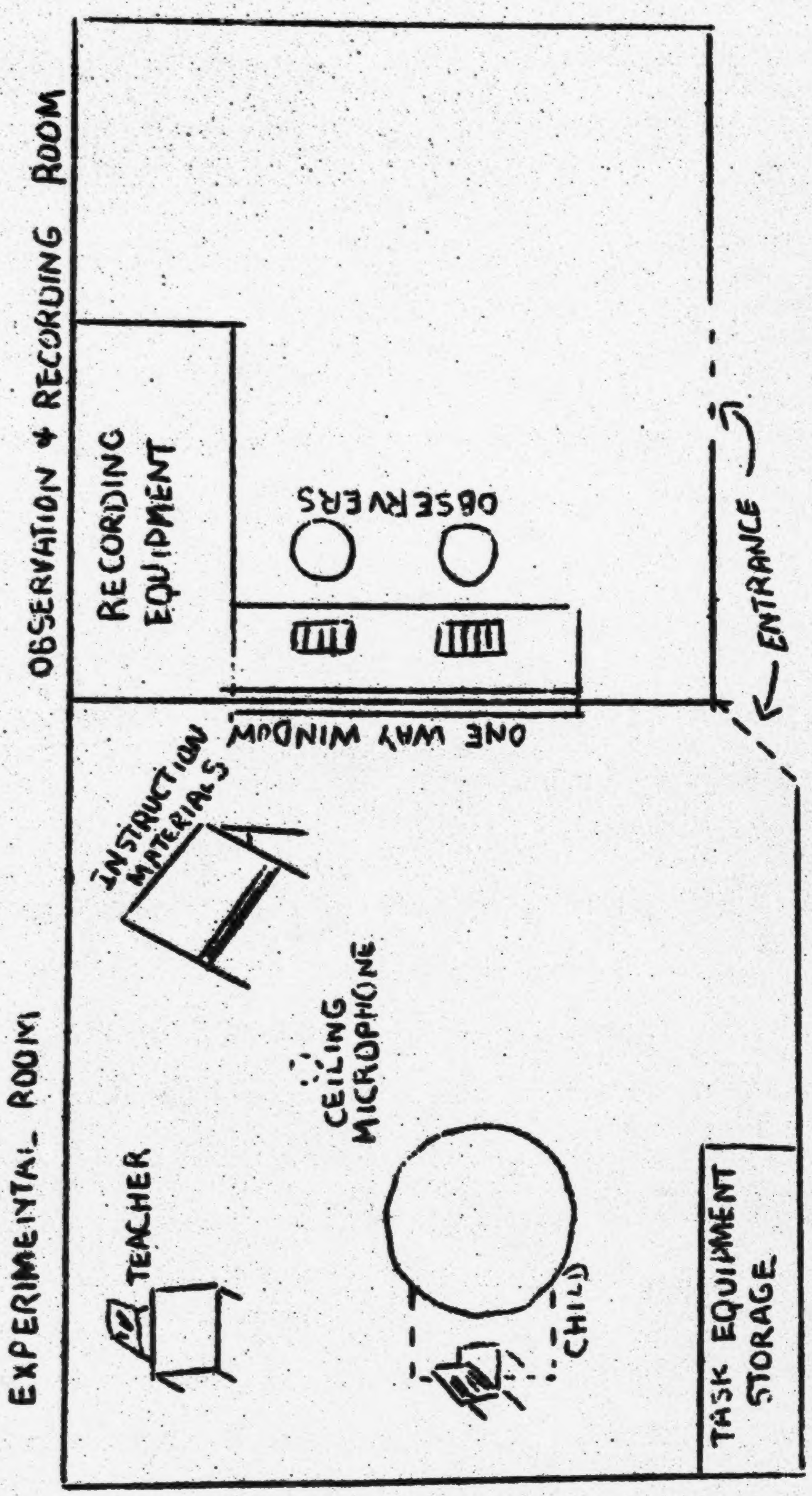
OBSERVATION + RECORDING ROOM
RECORDING EQUIPMENT
OBSERVERS
ONE WAY WINDOW
ENTRANCE
INSTRUCTION MATERIALS
CEILING MICROPHONE
EXPERIMENTAL ROOM
TEACHER
CHILD
TASK EQUIPMENT STORAGE

FIGURE 4

were located near one corner of the room. The legs of the chair and table were attached by epoxy cement to a 4 x 4 x $\frac{1}{4}$ inch thick pressed-board slab on the floor. When seated in the chair the subject was oriented directly toward a 3 x 5 foot one-way window in a wall connected to an adjoining observation room. Near the other corner opposite the observation window an adult-size chair and table were placed facing one side of the subject. Thus for the subject to attend visually to the teacher it was necessary for him to turn his head or body up to 90 degrees in his chair. Near a third corner -- adjacent to the observation window -- a 3 x 4 foot board was placed on an easel tray 3 feet above floor level facing diagonally toward the child's chair. Thus for the seated child to visually attend to the easel, he had to turn up to 45 degrees. The entrance to the room was located in the fourth corner. A microphone was attached to the ceiling. All objects were clearly visible to viewers in the observation room.

The teacher could privately communicate with the observation room by means of special equipment attached by a cord to her belt. Included were a small transcriber's earphone through which she could receive verbal instructions or electrically timed sounds, a throat microphone, and a 1 x 1 x 3 inch box to which was attached a toggle switch and two silent microswitches. The toggle switch was employed for timing of tasks, and the microswitches were used for indicating the dispensation of primary and social reinforcers by the teacher.

An array of recording equipment was located in the observation room. A tape recorder was connected to the ceiling microphone in the experimental room to obtain complete recordings of audible sounds. On the shelf before the observers were two identical sets of five piano-type keys, each key closing

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a microswitch when depressed. The keys were used primarily for observations of critical responses of subjects. A microphone on the shelf permitted an observer to talk to the teacher. To the right of the observation shelf were located a 20 pen Esterline Angus Event Recorder plus racks of timers, counters, voice-operated relays and other electrical equipment. All electrically operated response equipment of the observers and teacher were connected to corresponding pens on the event recorder, and in some cases to timers and counters as well.

Observer reliability. Prior to running the experiment proper, an observer was trained to reliably note the occurrence of each of the critical visual and verbal responses of subjects by depressing a specified key on her observation keyboard. To determine her reliability, another observer, well-trained in other research projects in the observation of visual and vocal responses, simultaneously noted the critical responses on an identical keyboard. Each observer response was recorded on a tape in the event recorder, moving at a rate of 3 inches per minute. A response was defined in terms of the number of 2 second intervals on the pen recorder tape on which the appropriate pen was displaced. Reliability was based upon the correlation between the two observers' corresponding observations for 20-second segments of each task. Interobserver correlations for the various visual attention measures ranged from .87 to .99, with a mean of .92. For vocalizations, correlations ranged from .93 to 1.00, with a mean of .96.

Baseline I. A female adult with whom all subjects were familiar brought the subject to the laboratory from his nursery school class. The teacher greeted the subject and seated him (her) at the child's chair in the experimental room. Throughout the procedure the teacher behaved in a pleasant,

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efficient, and otherwise neutral manner except when experimental procedures called for other responses. Each child was given four tasks, of approximately five minutes duration, in the following order.

(1) Sorting. The teacher lined up 5 white 2 x 3 x 4 inch boxes, each of which had a 1 3/4 inch slot on top. On each box was pasted a slot-sized disc of one of six colors. The teacher scrambled a large quantity of discs of each color on the table before the child. The teacher asked the child what the box reminded him (her) of and then requested that he drop the discs in the right boxes. At this point E returned to her own table, where she attended visually to the subject but initiated no other responses throughout the task except brief responses to the child's initiations, where appropriate. The task was terminated when all discs were inserted or if 5 minutes were up.

(2) Puzzle matching. The teacher placed a tray of blocks of varied geometric forms on the table before the child and an identical tray at 90 degrees from the child's position. After seating herself at the child's table before her tray, the teacher handed the child an 8½ x 11 inch sheet on which the boundaries of a geometric figure were drawn. The teacher kept an identical sheet face up before her on the table. (The figures can be filled by correct placement of several blocks.) The teacher placed a block on her form, with the request that the child watch how she did it, and then looked at the child. If the child failed to place the corresponding block on the board, the teacher requested that the child do what she did. The teacher followed each correct response of the child with a verbal reinforcement ("good," "fine," etc.), including responses of the child initiated in the absence of the teacher's example. If the child failed to respond after several prods, the teacher brought on another form. After four forms were

completed, or 5 minutes had passed, or continuous nonresponsiveness of the subject occurred the task was terminated.

(3) Number matching. The teacher placed a black 6 x 9 inch board on the child's table on which were three 1 x 6 inch transparent keys spaced at 1 inch intervals. A 1 x 1 inch card with a number on it was affixed to the bottom of each key, visible to the child. The teacher then placed a 22 x 27 inch poster on the easel located 45 degrees from the child's seating position. On the colored poster were 20 white 3 x 5 inch cards each containing one or more objects. The teacher sat at her own chair. Using a 5 foot aluminum pointer she pointed to cards containing the number of objects corresponding to each number on the child's response keys. After making sure that the child was able to recognize and label the numbers on his keys and could depress them when asked to, the teacher pointed to the objects one at a time in random order. The child was given a verbal reinforcement after each correct response. After each incorrect response, the teacher pointed again at the same object until the correct key was pushed or no response occurred. Each response key was connected to a pen on the event recorder in the observation room. The task was terminated after all cards had been pointed to, or 5 minutes were up, or continued errors or failures to respond occurred.

(4) Picture story. The teacher stood to the side of the seated child and held, waist high, a 9 x 12 inch colored picture of human and other objects in a common situation. She asked the child to tell her about the picture. After the child completed an utterance, the teacher gave a verbal reinforcement. If the subject failed to respond to the instructions or reinforcement, the teacher repeated the instructions or asked the child to tell what else he saw. If the subject only named objects in an utterance, the teacher asked

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"what are they doing?" After the child stopped responding to a picture, another picture was brought forth and the procedure repeated. The task terminated after 3 pictures were shown, or after 5 minutes, or if the child repeatedly failed to respond.

At the end of the session, the teacher gave the child a small attractive toy, and the assistant returned the child to the nursery school. Four different subjects from each of the two nursery school groups were brought to the lab for Baseline I sessions on each of two consecutive days.

Baseline II. Each of the subjects from Baseline returned to the experimental room on the third and fourth days for a second baseline session. The procedure was identical to Baseline I except that the order of the tasks was reversed and the level of difficulty for most tasks was increased slightly above the level of the child's performance during the first baseline period.

Modification of Responses of Selected Subjects

Data from the two baseline conditions were searched for responses on which the regular and head start subjects differed most significantly from each other. It was immediately apparent that across all tasks and both baseline periods, verbal responses were almost entirely absent in the Head Start group, in contrast to the regular group. The four subjects from each group who were most consistently nonverbal in the baselines were determined. Each set of 4 subjects was divided into 2 pairs, such that each pair was as similar as possible to the other. One subject from each pair was assigned to an experimental group and one to a control group.

The control group was not subjected to any experimental procedures. They attended their preschool class as usual. The primary purpose of the experimental group was to increase the level of verbal responsiveness of the

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subjects in the experimental classroom situation. Each subject in the experimental group was given a series of 3 5-minute tasks for 8 consecutive days, except for absences from the preschool. The tasks varied in specific content across days, but were all of three types, in the following order: (1) naming and describing objects and pictures, (2) telling a story with dolls and other objects, and (3) responding to an interview in which the teacher asked about the functions of common objects and events. The same teacher who had run the baseline sessions also served as teacher in this phase.

For the first two sessions, the teacher reinforced each desired verbal response with both social approval and a small piece of candy, which she delivered casually into a shallow paper container near the child. The child could eat or hoard the candy as he wished. After the second day, variations in reinforcements, reinforcement schedules, and task stimuli were introduced in accordance with the behavior of the individual subject. For example, if the child showed an increase in verbal responsiveness under the continuous reinforcement schedule, the teacher shifted to a partial schedule. If this was successful, a brief extinction period was attempted. In some cases only candy or only social reinforcement was withdrawn in a given period. In two cases, a friend of the subject was brought into the experimental room from the nursery school to serve as a reinforced model. At the end of each session, each subject was given a small toy.

Post Experimental Baselines

An attempt was made to run two more baseline periods on the four experimental and four control subjects at the end of the training period. The third baseline was designed to be identical to the first preexperimental baseline. A fourth was prepared to correspond to the second, except that a

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new teacher was introduced. However, depletion of the sample due to family vacations and other uncontrollable circumstances did not permit full participation. One subject from each of the four conditions participated in the third baseline. Only two subjects were available for the fourth. The baseline sessions were run immediately following the last day of the experimental training sessions.

Results and Discussion

The results of the baseline assessments of the two groups of subjects are reported in Table 7. The KU subjects spent a significantly greater proportion of their task time talking to the teacher, both in response to instructions (reinforced picture description task) and spontaneously (nonreinforced sorting task). Talking occasions, on the other hand, were not reliably different between the groups on the picture task. These two findings in combination indicate that when called upon to respond verbally to complex visual stimuli, the KU subjects gave longer vocalizations per response occasion. This difference between the groups did not change across baseline sessions. The results indicate, then, a persisting verbal deficiency in the Head Start relative to the KU subjects.

The results for eye contact show that the Head Start subjects glanced significantly more frequently at the teacher during the initial baseline session than did the KU subjects. However, on most of the tasks, this difference disappeared by the second baseline session. The above results were obtained both on tasks in which the teacher responded to correct performance with verbal reinforcement (puzzle and number tasks) and on the task in which she was nonresponsive (sorting). In contrast to the Head Start subjects, the KU group more often attended to task materials. It should be noted that

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TABLE 7

Responses of Regular (KU) and Head Start (HS) Subjects in Baseline Sessions

	MEANS PER TASK TIME				STATISTICAL COMPARISON		
	Baseline 1		Baseline 2				
Response Category	KU	HS	KU	HS	KU vs. HS	B1 vs. B2	Interaction
TALKING TIME							
Sorting	.05	.00	.08	.00	t=2.73**		
Puzzle	.02	.00	.02	.00	NS		
Number	.03	.04	.02	.05	NS		
Picture	.24	.11	.24	.13	t=2.90**		
Total	.34	.15	.36	.18	t=2.77**		
TALKING OCCASIONS							
Sorting	.04	.00	.09	.00	t=2.83**		
Puzzle	.03	.00	.03	.00	NS		
Number	.07	.09	.05	.11	NS		
Picture	.26	.18	.25	.15	NS		
Total	.40	.27	.22	.26	NS		
EYES ON TEACHER TIME							
Sorting	.08	.17	.06	.01	NS	F=9.76***	F=5.46**
Puzzle	.03	.06	.01	.04	F=3.24*	F=7.50**	NS
Number	.09	.24	.12	.21	F=5.69**	NS	NS
Picture	.23	.20	.29	.20	NS	NS	NS
Total	.43	.67	.48	.46	NS	NS	NS
EYES ON TEACHER OCCASIONS							
Sorting	.05	.12	.05	.02	NS	F=12.69***	F=10.54***
Puzzle	.03	.05	.01	.04	F=3.35*	NS	NS
Number	.09	.28	.15	.19	F=6.54**	NS	F=5.20**
Picture	.10	.14	.15	.12	NS	NS	NS
Total	.27	.59	.36	.37	F=3.96	NS	F=12.88***
EYES ON TEACHER OCCASIONS / EYES ON TASK MATERIALS OCC.							
Sorting	.74	1.03	.70	.82	F=4.67*	NS	NS
Puzzle	.09	.14	.04	.09	NS	F=4.72*	NS
Number	.12	.42	.20	.27	F=5.49**	NS	F=4.08*
Picture	.98	1.08	.97	.97	NS	NS	NS
Total	.19	.42	.24	.26	F=3.53*	NS	F=10.32***
REINFORCEMENTS PER RESPONSE							
Number	.91	.58	.81	.64	F=8.86**	NS	NS

(See footnotes for Table 7 on next page.)

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Table 7 Footnotes

* p .10 ** p .05 *** p .01

NOTE -- "Time" measures indicate percentage of task time during which the given response was made. "Occasion" measures indicate the number of occasions of an event relative to task time. (e.g., three occasions of an event in a five minute task = .60.) Occasion measures should be considered only relative to each other, not as percentage of task time. *t* tests were used to compare KU and HS where inspection indicated no baseline effects.

glances at the teacher were not facilitative of task performance since the teacher purposely maintained a constant nonexpressive posture, restricting her responses to verbal approval. In this case, then, visual attention to the teacher was nonadaptive. However, the second baseline scores indicated that the Head Start subjects had rapidly decreased their glances toward the teacher to a level comparable to the KU subjects. A likely explanation is that it took two sessions for the Head Start subjects to adapt to the "middle class" teaching situation. The superiority of the KU subjects to the Head Start subjects in Peabody scores in Study I could have been at least partly affected by this proposed adaptation phenomenon. Thus, a major implication of this study is that a lack of quick adaptation to testing situations may produce misleadingly low scores among Head Start groups.

On the other hand, the reinforcements received per response on the number task, as well as the aforementioned verbal responsiveness findings, show that the KU group significantly outperformed the Head Start group in both baseline sessions, thus ruling out adaptation as a complete explanation of performance differences. The deficiency of performance of the Head Start group occurred not only with regard to verbal facility, but also on a motor

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task requiring manual indication of the discrimination between elementary numerical concepts.

The stable differences in amount of verbal responsiveness between the two groups led to the selection of vocalization as the dependent variable in the conditioning sessions. Head Start subject C (Figure 6) showed a dramatic rise in talking by the third session under continuous primary and social reinforcement. Head Start subject D (Figure 7) failed to increase under the same conditions during the first three days. On the fourth day a highly responsive friend of the subject was brought into the laboratory. The friend was rewarded for good verbal performances in the presence of the subject. The effect of this model on subject D was almost immediate and the subject's improved level of performance was maintained over the following three days, under similar conditions. Subject A from the KU sample showed such a rapid increase by the third session of continuous primary and social reinforcement that her remaining sessions were used for testing the effects of various schedules. Figure 8 indicates that her responses, extinguished rapidly, were rapidly reinstated with partial reinforcement, extinguished again, and then increased again with social reinforcement alone. Subject B from the KU group (Figure 9) was unresponsive to approval, candy, toys, and even a reinforced model across eight sessions. His apparent sudden increase in the final post-experimental baseline session was mainly due to task-irrelevant vocalizations, i.e., expressions of his pleasure that his presence would no longer be required. With the exception of this subject, a few fifteen minute sessions of continuous reinforcement, contingent upon the appropriate verbal responsiveness of the child, appeared to be highly effective in increasing the level of a response which is thought to be important in learning and in

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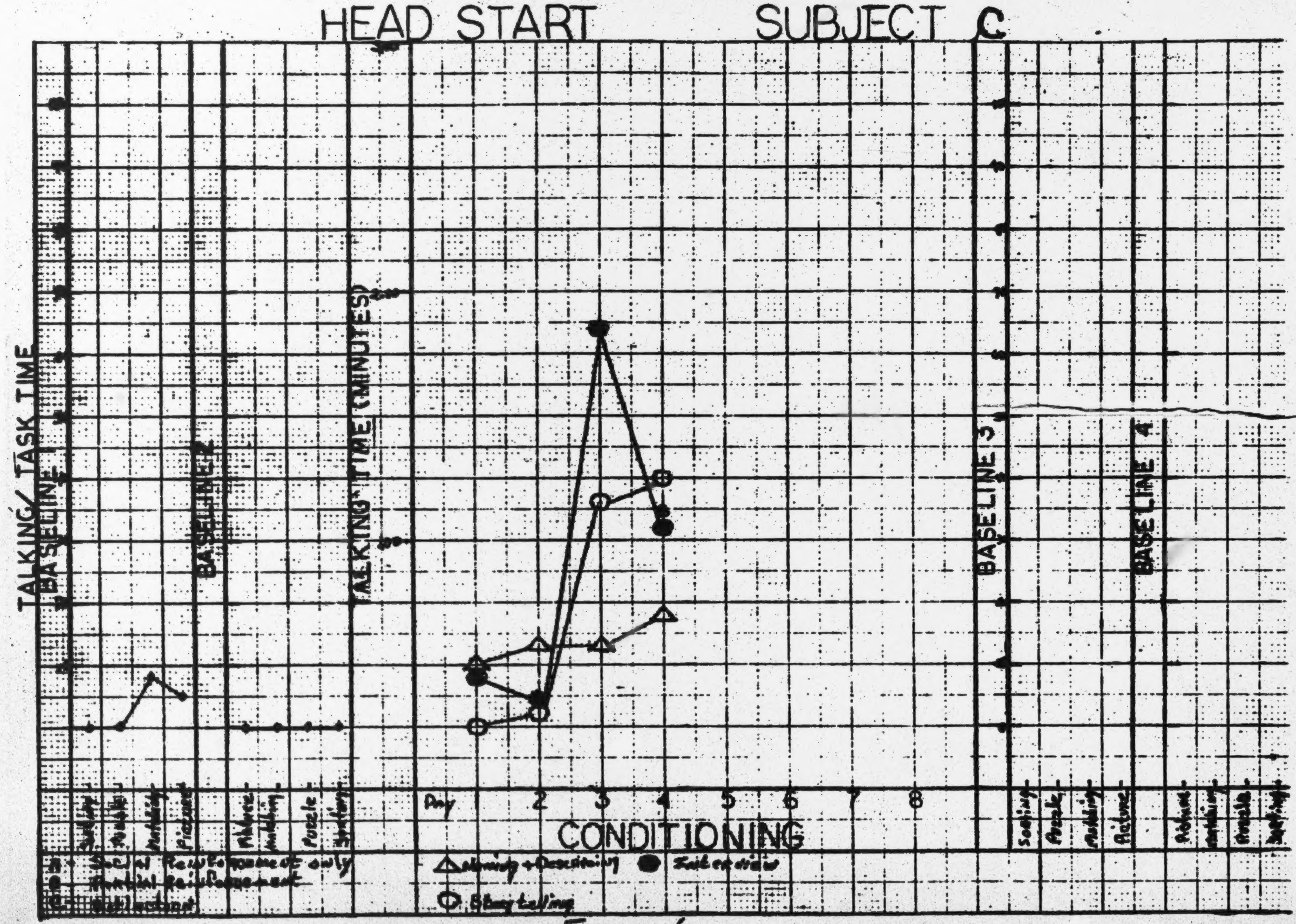

Figure 6

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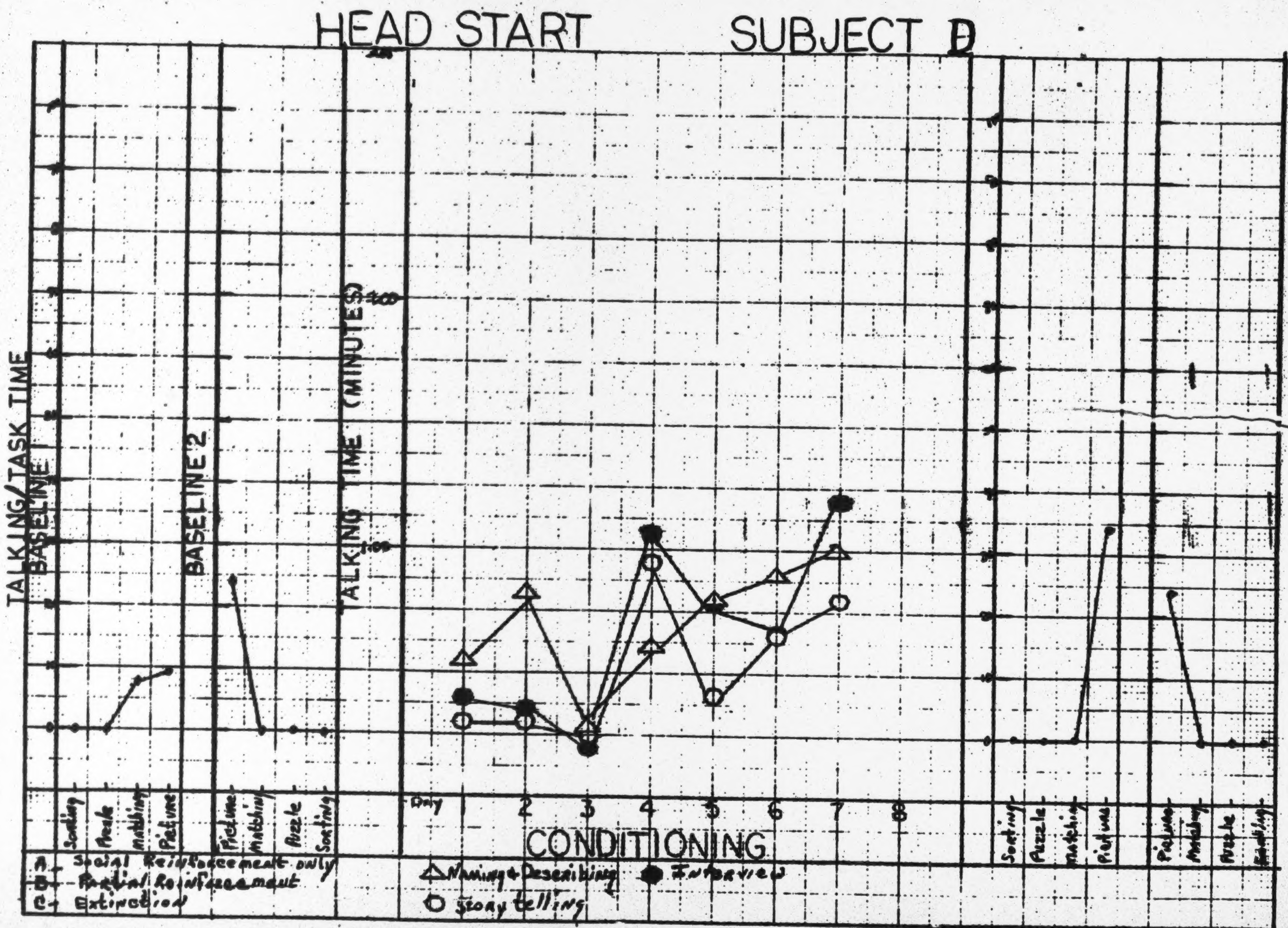

Figure 7

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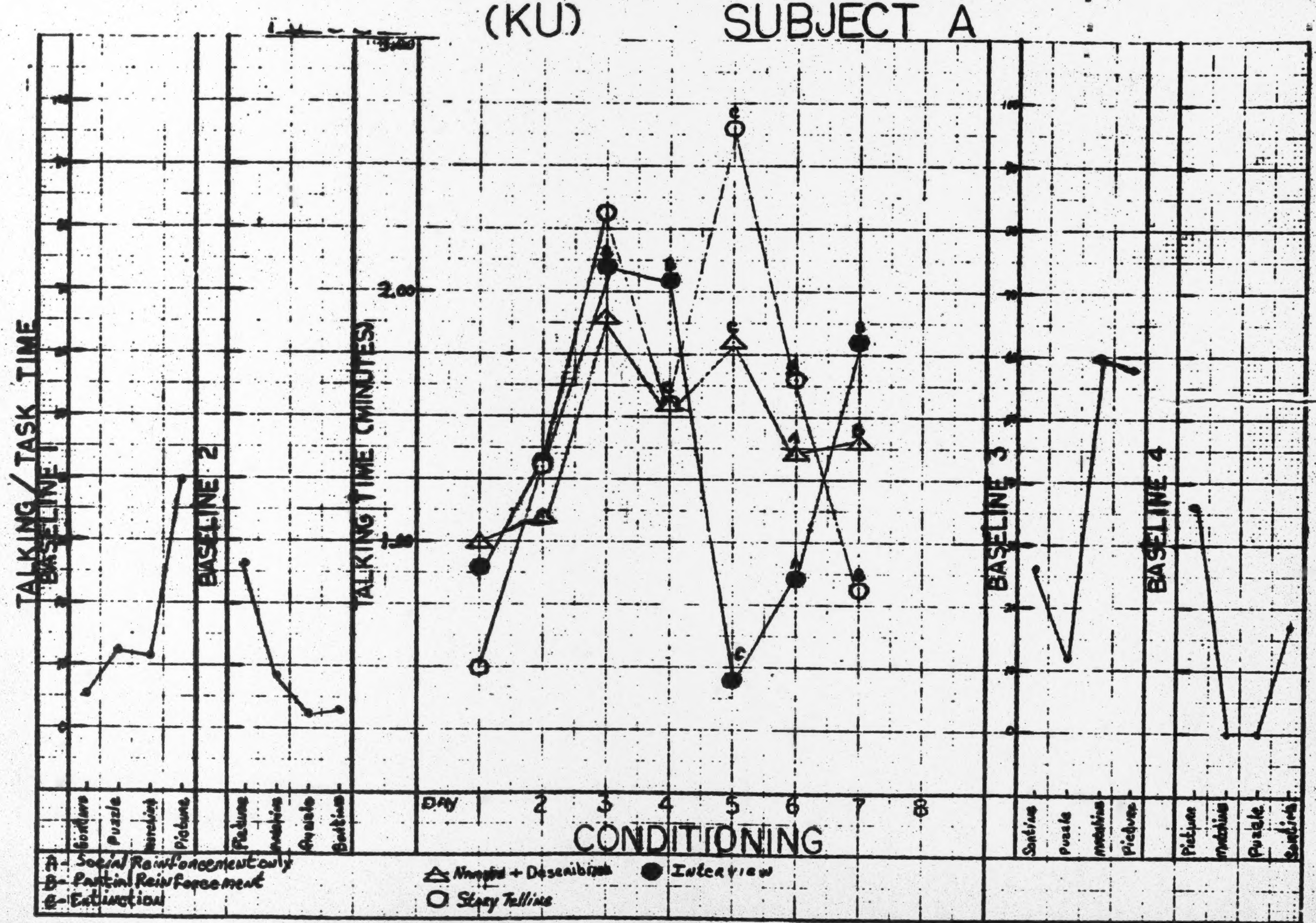

Figure 8

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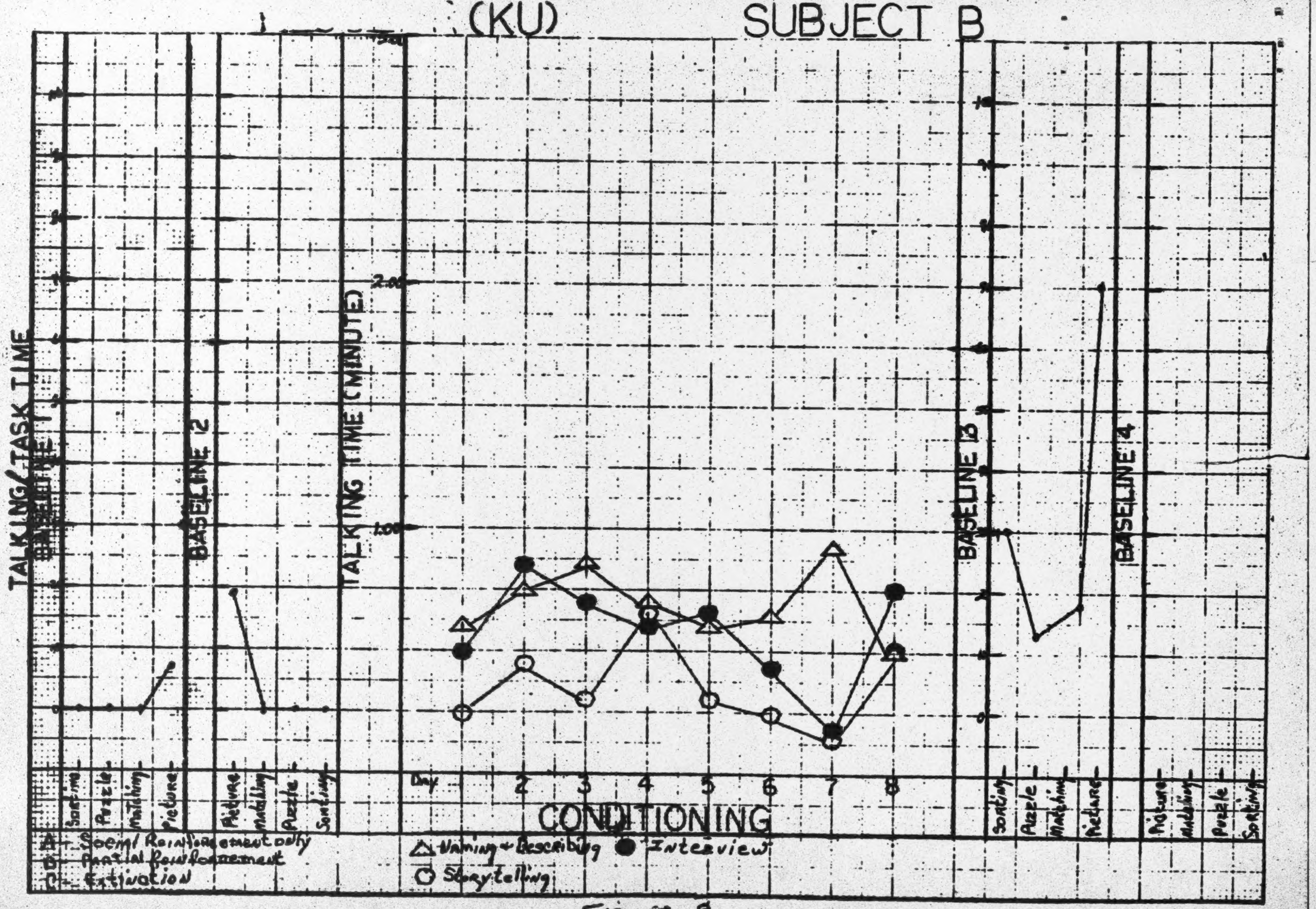

Figure 9

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classroom performance. The use of a reinforced model may have particularly important implications for the structuring of classroom groups.

Conclusions

Several significant implications can be drawn from the results of this study. First, attention to task-relevant cues among Head Start children may be temporarily deficient in an initial encounter with a strange middle class teaching situation. In particular, the Head Start children appeared to be searching for indications of approval or disapproval from the teacher. If attention to the nonverbal responses of a teacher could facilitate performance, attention to them could, of course, be functional -- especially for children who are deficient in ability to comprehend a teacher's verbal responses. In the current tasks, however, such attention was incompatible with attention to relevant task materials. Apparently the Head Start children learned this fact by the second session, at which time their attention to teacher relative to task had decreased significantly.

Second, it is apparent that the greater visual attention to task-relevant stimuli across baseline sessions was not sufficient for the Head Start subjects to overcome their initial performance deficit. The difference between performance in samples of two subjects may even underestimate the differences that would be found in the general populations of Head Start and other children. Many of the Head Start group in the current studies had had the advantage of weekly participation in an enriched preschool prior to their participation in the current Head Start program. Furthermore, they were about a year older than the current KU sample with whom they were compared.

It should be noted that neither sample of subjects was intended to be representative of the two nursery school groups from which they were selected. They were selected on the basis of their relative nonresponsiveness as perceived by preschool teachers in order to understand the problems of children most in need of help. Thus our generalizations would most appropriately be applied to the relatively less responsive children of each subject population.

A final implication of this study is that the persistent behavioral deficiencies of the Head Start children revealed in the baseline sessions appear to be reversible. Systematic reinforcement of two Head Start subjects, in one case supplemented with a model, led to dramatic increases in verbal responsiveness within three or four brief sessions. The latter subject was matched with his twin sister who had performed almost identically in the baseline sessions, but who had not gone through the special training. Her experience in the nursery school during that period apparently was sufficient to raise her verbal performance level to that of her brother at the third baseline session. Future studies would benefit from comparisons of Head Start children in preschool and special training groups with comparable samples who participate in neither condition.

SUMMARY

Three comparative research studies on a Head Start group and a middle-class preschool group are included in this final report. Study I involved the administration of Project Head Start evaluation measures to the middle-class preschool population. Analyses indicated that no change was found on the Peabody Picture Vocabulary Test in the middle-class group while an increase in scores was found for the Head Start group. The Preschool Inventory showed the middle-class preschool group to be significantly higher in performance but some changes occurring over the summer for the Head Start group. Study II compared performance of the two groups on two discrimination learning tasks. No overall differences were found between the groups but a group x sex interaction was indicated. In Study III children judged to be low in social responsiveness were selected from the two groups and their performance in a laboratory setting was assessed. The major differences between the Head Start and middle-class group in a baseline assessment appeared to be in vocalizations. Four children, two from each group, were selected for intensive conditioning experience. Changes in vocalizations were apparent in three of the four children during the experimental sessions.

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FOOTNOTES

1. This research was carried out with the aid of a number of people. The authors would like to express their appreciation to Suzanne Saldarini, Carolyn Swift, Patricia Self, Virginia Sullwold, Lucille Paden, Cheryl Butcher and Susan Huang. Throughout the summer the Nursery School teachers and Head Start staff cooperated in many ways and created the conditions which made it possible to collect data. We are especially indebted to Margaret Cooper, Carolyn Thomson, and Betty Coats and gratefully acknowledge the help of Harold Strang, Leslie Pyenson, Daniel Lettieri, Katherine Sippola, and Karen Cohen.

2. Department of Human Development and Family Life, Department of Psychology and Bureau of Child Research, University of Kansas.

3. Department of Psychology and Bureau of Child Research, University of Kansas.

4. The Behavior Inventory and the Psychological Screening Inventory were also administered but the data are not yet analyzed and are not reported in this paper.

5. Miss Margaret Cooper.

6. Miss Cooper was assisted by Mrs. Suzanne Saldarini.

7. Miss Cooper was assisted by Mrs. Carolyn Swift.

8. Mrs. Katherine Sippola, Parent Coordinator and Mrs. Karen Cohen, Student Assistant.